

Japanese Unexamined (*Kokai*) Patent Publication No. S57-169097, published October 18, 1982; Application No. S56-52471, filed April 9, 1981; Inventors: Ryoza YAMAGISHI, Osamu YOSHIOKA, and Tetsuo ISHIKAWA; Assignees: Hitachi Densen KK and KK Hitachi Seisakusho [Hitachi Cable Ltd. and Hitachi Ltd.]

PLATING METHOD FOR A LONG PIPE

[Claim]

Plating method for a long pipe characterized in that a long pipe to be plated is erected, and a plating liquid storage tank and plating liquid circulation pump are provided; the installation surface and plating liquid surface of the aforementioned plating liquid storage tank are positioned higher than the bottom part of the aforementioned long pipe; the plating liquid is circulated between the plating liquid storage tank and the long pipe by means of the plating liquid circulation pump, and plating is carried out.

[Detailed Explanation of the Invention]

The present invention concerns a plating method for, e.g., the inner surface of a long pipe.

Conventionally, with respect to methods for coating a metal onto the inner surface of a long pipe, there are electroplating and chemical plating methods. In these cases, the plating is carried out wherein the long pipe is either caused to stand erect, inclined, or caused to be horizontal.

When the long pipe is made horizontal or inclined, even when the pipe is long, because the equipment is not very high, the workability is satisfactory, but (1) with electroplating, it is difficult to align the positive electrode centrally, and this causes non-uniformity in the plating thickness in the circumferential direction. (2) With chemical

plating, there are defects such as the fact that powder-like impurities adhere to the plating surface.

Therefore, a method of erecting the pipe is satisfactory, but in the case of an erecting method, because the lifting range of the pump must be greater than with an inclined method and item with a high allowable value of pressure resistance is necessary, there has been a defect in that the resulting device is made large. With chemical plating in particular, because metals precipitate in the pump, there is a tendency for the expulsion pressure to reduce over time. Therefore, the pump must be made larger, and excess capacity must be provided for the lifting range.

The objective of the present invention is to offer a plating method for a long pipe wherein the aforementioned defects of the conventional technology are resolved, and by erecting the pipe, even when the length is long, a pump with a low lifting range can be applied.

That is to say, the main point of the present invention is that a long pipe to be plated is erected, and a plating liquid storage tank and plating liquid circulation pump are provided; the installation surface and plating liquid surface of the aforementioned plating liquid storage tank are positioned higher than the bottom part of the aforementioned long pipe; the plating liquid is circulated between the plating liquid storage tank and the long pipe by means of the plating liquid circulation pump, and plating is carried out.

An embodiment of the plating method for a long pipe of the present invention is explained by means of the appended drawings.

The present embodiment explains the manufacture of a nuclear fuel rod covered pipe wherein copper plating is carried out on the inner surface of a zircaloy pipe.

First, multiple zircaloy pipes (outer diameter: 12 mm, inner diameter: 10 mm, length: 4,000 mm) are prepared. These are degreased using normal methods and acid-washed. After an oxide film coating is formed by means of an autoclave, a mixed aqueous solution of vanadium chloride and stannous chloride is passed through the aforementioned pipe; then, by additionally passing diluted hydrochloric acid, metallic vanadium particles adhere to the inner wall of the pipe.

As shown the drawing, the multiple zircaloy pipes (1) are erected in a pit with a depth of 3,000 mm, are covered with an adiabatic material (2), and are affixed to a zircaloy pipe installation platform (3). A plating liquid installation tank (4) and a plating liquid circulation pump (5) are provided along with the piping. At this time, the installation surface (6) and plating liquid surface (7) of the aforementioned plating liquid storage tank (4) are positioned higher than the bottom part (8) of the aforementioned zircaloy pipe (1).

The chemical plating liquid (11) inside the plating liquid storage tank (4), which is temperature-controlled to 50 – 60°C by a heater (9) and a thermostatic tank (10), is siphoned up by the plating liquid circulation pump, and is fed to a plating liquid distribution case (13) through a T-shaped pipe (12). The lifting range required by the circulation pump (5) is not the distance between the two pipe end connection jigs (14a, 14b), but rather the distance wherein the height of the aforementioned pipe end connection jig (14b) is subtracted from the height of the plating liquid surface (7) in the plating liquid storage tank (4). Even when the pipe (1) is long, it is the same when the pit is deep.

In the plating liquid distribution case (13), the same number of liquid outlets as zircaloy pipes (1) is provided, and the terminals thereof are respectively connected to the pipe end connection jig (14b). With the plating liquid distribution case (13), the liquid distributed into multiple channels passes through the zircaloy pipe (1), and by contacting the zircaloy pipe, precipitation of the copper is begun.

In this way, by repeating the plating liquid circulation over a long term, the plating layer is gradually formed, and at the point when the plating layer reaches a predetermined thickness, the plating liquid circulation is stopped.

Afterwards, the zircaloy pump is removed, but because a large quantity of plating liquid remains, refluxing of the plating liquid is necessary. The refluxing method is carried out wherein a refluxing valve (16) is opened and a refluxing pump (17) is operated. By forming refluxing channels in this manner, the operation proceeds very smoothly when the plating is completed. After this operation is completed, the pipe end connection jigs (10a, 10b) are loosened and the zircaloy pipe (1) is removed from the adiabatic material (2) and zircaloy pipe installation material (3). Then, it is fed to a water-washing and drying process.

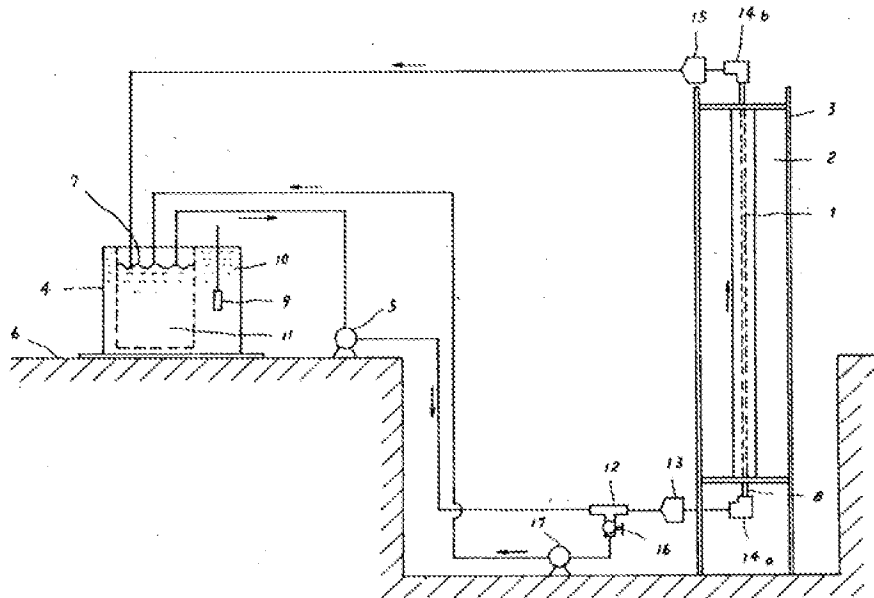
As has been made clear by the above explanation, with the method of the present invention, because the installation surface and plating liquid surface of the plating liquid storage tank are positioned higher than the bottom part of the erected long pipe, a satisfactory type of this product can be obtained. Additionally, by erecting the long pipe, even when the length is long, a pump with a low lifting range can be applied, and the result is that the device does not have to be made large. It is a matter of course that the

present invention may be applied to the plating of both the inside and the outside of a long pipe.

Simple Explanation of the Drawing

The drawing is an explanatory diagram of an embodiment of the plating method of a long pipe of the present invention.

1: zircaloy pipe; 3: installation platform; 4: plating liquid storage tank; 5: plating liquid circulation pump; 6: installation surface; 7: plating liquid surface; 8: pipe bottom surface; 11: chemical copper plating liquid; 13: plating liquid distribution case; 14a, 14b: pie end connection jigs; 15: plating liquid collection case; 17: refluxing pump.



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